



## Milestone for bug-proof quantum communication

University of Stuttgart receives 1.6 million Euros for the construction of a quantum repeater

**In a digitally linked world, quantum cryptography offers a highly promising solution in order to safely encrypt data and to guarantee its correctness (integrity). However, the transmission rates and the achievable distances have been limited up to now due to technical difficulties. The Institute of Physics (3) and (4) as well as the Institute of Semiconductor Optics and Functional Interfaces at the University of Stuttgart are now in the framework of the new project Q.Link.X building a so-called quantum repeater that increases the range of the quantum cryptography.**

Quantum cryptography makes data absolutely bug-proof because in contrast to classic encryption techniques it is not based on the hope that a mathematical problem can only be solved with a great amount of effort but on a physical principle. This comprises a single quantum – for example a photon of light – only being able to be measured one single time. If a code for a cryptographic connection is now transmitted with this quantum, it immediately becomes apparent whether this code is safe or not. Only when the safety is guaranteed will the actual transmission be carried out.

These connections have already long been researched at the University of Stuttgart and at other institutions. Nevertheless, an absolutely safe transmission over long distances, for example in an optical glass fiber, has not been possible up to now. Attenuation namely automatically occurs here that means the loss of the photon after a certain distance. Larger networks, like for example in China between Shanghai and Beijing, therefore need many intermediate stations. These in turn pose a

### University Communication

**Head of University Communication and Press Spokesperson**  
Dr. Hans-Herwig Geyer

Contact  
T 0711 685-82555

**Contact person**  
Andrea Mayer-Grenu

**Contact**  
T 0711 685-82176  
F 0711 685-82291  
hkom@uni-stuttgart.de  
www.uni-stuttgart.de



safety risk since the information is again available there in plain language.

An alternative would be to equip the quantum cryptography with various intermediate stations that do not measure the quantum status of the system but receive the quantum information themselves: so-called quantum repeaters. Such signal amplifiers will be set up in the coming years by the University of Stuttgart in the framework of a joint project going by the name "Quantum-Link-Extension" (Q.Link.X). The Federal Ministry of Education and Research is making 1.6 million Euros available for this. Q.Link.X aims at realizing fiber-based distances for the quantum code transmission and expanding their reach.

#### **Around 25 partners from science and business**

Since various components are required for this type of quantum repeater, several work groups at the University of Stuttgart are involved that are specialized in the individual components. The Institute of Physics (3) and (4) and the Institute of Semiconductor Optics and Functional Interfaces (IHFG) optimize the components and will produce a complete demonstrator for this type of connection route. Furthermore, nationwide there are 20 scientific as well as three close-to-market partners and smaller companies involved in the project.

The researchers are confident that the development of quantum repeaters will contribute towards the quick development of quantum communication over large distances. The core components are also to be incorporated in the future cluster "Quantum sciences from the basics to the application: development of quantum tools of the future" for which the University of Stuttgart is currently applying in the framework of the excellence strategy in order to strengthen cutting edge research in Germany.

#### **Professional contact:**

Professor Dr. Peter Michler, Dr. Michael Jetter, University of Stuttgart, Institute of Semiconductor Optics and Functional Interfaces,  
Tel.: +49 (0)711/685 -64660/-65105, email: p.michler (at) ihfg.uni-stuttgart.de, m.jetter (at) ihfg.uni-stuttgart.de